

WO 2004/054914

PCT/DE2003/003993

Specification

Sheet Combining Device and a Method for Combining Sheets

The invention relates to devices for mixing continuous webs, and to a method for mixing continuous webs, in accordance with the preambles of claims 1, 5 or 7 or 19.

The invention relates to a mixing device for continuous webs which can be used in the printing of newspapers between a printing press and a transverse folding device in order to bring a plurality of imprinted paper webs into an arrangement desired for the finished printed product. The invention in particular relates to a mixing device for continuous webs suitable for printed products in tabloid format.

DE 43 26 855 A1 discloses a mixing device for continuous webs, having a former and two guide paths, on each of which a cut partial web is conducted, wherein one of the partial webs is provided with glue along its way and is subsequently glued together with the second partial web. In another embodiment, two continuous webs run over two formers, wherein one of the continuous webs stapled by means of a stapler and the other continuous web is glued in the mentioned way before they are both combined in a main continuous web.

A mixing device for continuous webs with at least one former is known from DE 43 44 362 A1, wherein the continuous web leaving the former can be selectively conducted around one or the other side of a further former located underneath.

The object of the invention is based on creating mixing devices for continuous webs, and a method for mixing continuous webs.

In accordance with the invention, this object is attained by means of the characteristics of claims 1, 5 or 7 or 19.

The advantages to be obtained by means of the invention lie in particular in that the mixing device for continuous webs permits the production of multi-layered products, in particular tabloid products, wherein at least one layer of the product is stapled.

A further advantage is that the continuous web mixing device makes do without turning bars.

The costs of the device are reduced because of this. Furthermore, drawing webs of material to be processed into the device prior to its being put into operation can be made simply and rapidly. Moreover, not needing to turn them reduces the susceptibility of the continuous web mixing device to operational malfunctions.

In this case the continuous web mixing device can have at least one second former and a guide path for guiding a second partial continuous web from the second former to the outlet. By means of such a device a partial continuous web from the continuous web cut apart by the longitudinal cutter can be mixed with the second partial continuous web from the second former to constitute a first book, while the other partial continuous web from the continuous web cut apart by the longitudinal cutter is stapled and becomes a second book.

A folding apparatus is preferably connected to the outlet of the continuous web mixing device. Tabloid products can be finished by means of the folding apparatus from the continuous web exiting the continuous web mixing device.

Exemplary embodiments of the invention are represented in the drawings and will be described in greater detail in what follows.

Shown are in:

Fig. 1, a cross section through a first exemplary embodiment of a continuous web mixing device,

Fig. 2, a cross section through a second exemplary embodiment of a continuous web mixing device,

Fig. 3, a cross section through a third exemplary embodiment of a continuous web mixing device,

Fig. 4, a cross section through a fourth exemplary embodiment of a continuous web mixing device,

Fig. 5, product examples a) to m) of the above mentioned exemplary embodiments.

A continuous web mixing device 01 represented in Fig. 1 comprises two formers 02, 03, guide rollers 04, 06, 18, two longitudinal cutters 07, 08, deflection rollers 09, 11, 12, 13, 14, 16, two traction rollers 05, 10, as well as a stapler 17. A folding apparatus 19 is connected to the continuous web mixing device 01, which comprises a cylinder 21, for example a cutting cylinder 21, a cylinder 22, for example a cutting groove, point and folding blade cylinder 22, as well as a cylinder 23, for example a folding jaw cylinder 23.

A continuous web 24 is pulled through the former 03 in the direction of the drawn-in arrow. The continuous web 24 is constituted of a plurality of parallel running paper webs 24, which together are processed into tabloid products. In the course of the passage through the former 03, the longitudinally-cut partial webs running side-by-side over the former 03 are brought together. Following the former 03, the

folded continuous web 24, which here has partial webs placed on top of each other, runs over guide rollers 06 and terminates in the traction roller 05, 10, or the traction roller group 05, 10. After passing through the former 03, the continuous web 24 therefore consists of double the number of parallel extending paper webs 24 which, however, are of a lesser width than the paper web 24 prior to terminating in the former 03. The continuous web 24 is conducted over the deflection rollers 14, 16 to the guide rollers 18 and leaves the continuous web mixing machine 01 via the latter.

A continuous web 26 is correspondingly conducted into the former 02 and also consists of a plurality of parallel extending paper webs after having been longitudinally cut and moved apart. This continuous web 26 can be obtained, for example, together with the web 24, by longitudinally cutting a double-width web imprinted in a printing press prior to entry into the continuous web mixing device 01.

The partial webs of the continuous web 26 are brought together in the former 02 and, after leaving the former 02, are fed via the guide rollers 04 to the traction rollers 10, 05. Leaving the traction roller 10, 05, the continuous web 26 is conducted to the deflection roller 09 where, in contrast to the continuous web 24, it is divided into two partial continuous webs 27, 28, for example paper webs 27, 28.

From the deflection roller 09, the partial continuous web 28 is conducted via the deflection roller 11 to the guide roller 18, i.e. to the outlet of the continuous web mixing device 01. It is combined there with the continuous web 24. Since the continuous webs, or partial continuous webs 24, 27,

28 are brought together in the area of the guide rollers 18, the place where they are brought together in the area of the guide rollers 18 is called an outlet although, strictly structurally considered, it can also be located further downstream in respect to the continuous web.

In contrast thereto, the partial continuous web 27 runs from the deflection roller 09 to the stapler 17. The stapler 17 staples each of the paper webs 27 constituting the partial continuous web 27 - before it enters the former 19 - together along a line between two sides of the printed image generated on them, where later a transverse fold will be generated in the course of the passage of the continuous web 27 through the folding apparatus 19. After leaving the stapler 17 the partial continuous web 27, now consisting of paper webs 27 stapled together in some places, is also conducted over the deflection rollers 12, 13 to the guide roller 18 and is united there with the partial continuous web 28, as well as with the continuous web 24. In this way a main continuous web 29, which is composed of the not yet stapled paper webs of the continuous web 24, the not yet stapled paper webs 28 of the partial continuous web 28, and the stapled paper webs 27 of the partial continuous web 27, leaves the guide rollers 18 constituting the outlet from the continuous web mixing device 01.

This main continuous web 29 enters between the cutting cylinder 21 and the cutting groove, point and folding blade cylinder 22 of the folding apparatus 19. A folding jaw cylinder 23 follows the cutting groove, point and folding blade cylinder 22. The main continuous web 29 is cut in a known manner into individual products between the cylinders

21, 22 of the folding apparatus, which are subsequently transversely folded between the cylinders 22, 23. The tabloid products produced by means of the shown continuous web mixing device 01 have an outer, not stapled layer and an inner, stapled layer.

Since it is possible at the deflection roller 09 to distribute the paper webs 26 of the continuous web 26 as desired to the partial continuous webs 27, 28, and one paper web 26 corresponds respectively to four pages of the finished printed product, the change of the stapled layer into cuts of respectively four pages can be selected as desired.

The continuous web mixing device 01 is not limited to the specific embodiment represented. For example, it is possible to modify the continuous web mixing device 01 in such a way that the stapler 17 is arranged in the guide path for the partial continuous web 28, instead of being arranged in the guide path for the partial continuous web 27. In that case, the paper webs constituting the partial continuous web 28 are stapled together at predetermined locations by the stapler 17, while the paper webs 27 constituting the partial continuous web 27 remain not stapled. After uniting the partial continuous webs 27, 28 with the continuous web 24 into the main continuous web 29 at the outlet of the continuous web mixing device 01 at the guide rollers 18, and after passing through the folding apparatus 19, tabloid products are created by means of the alternative embodiment of the continuous web mixing device 01 which have three layers, wherein an outer and an inner layer are not stapled, while a layer between these two layers is stapled.

The continuous layer 26 could of course also be conducted in one piece, possibly together with paper webs branched off the continuous web 24, through the stapler 17 if a larger size is desired for the stapled layer than for the one not stapled.

Depending on the width of the printing press arranged upstream of the continuous web mixing device 01, the continuous web mixing device 01 can also have more than two formers, wherein then the partial continuous web conducted through the stapler 17 can be a part of a longitudinally cut continuous web coming from one of the formers, or can also constitute this continuous web in its entirety and can additionally contain paper webs from a continuous web coming from an adjoining former.

In another embodiment, the longitudinal cutter(s) 07, 08 is or are not arranged upstream of the former 02, 03, but downstream of the former 02, 03. In this case the folded continuous web 28 is cut open at the folded spine downstream of the former 02, 03.

In an embodiment represented in Fig. 2, at least two continuous web guides of partial continuous webs 27 and 28 are assigned to a former 02 and the continuous web 26 formed by means of this. For this purpose, the continuous web 26 is longitudinally cut (upstream or downstream of the former 02, as mentioned above), and is then divided onto the continuous web guides of the partial continuous webs 27 and 28. At least one of the continuous web guides, however, in an advantageous manner both, here have a stapler 17 along their path. One or both of the partial continuous webs 27, 28 can

be stapled before they are again combined into a product and further processed in the folding apparatus 19.

As indicated in dashed lines, a third partial continuous web 31 can also be conducted out of the continuous web 26 and can be stapled by means of a possibly provided stapler 17, before it, too, is again combined to form the product. A continuous web guide is also shown in dashed lines, wherein a partial continuous web 32 is conducted, for example, without being rerouted and/or without being stapled, straight downward to the entry into the folding apparatus 19.

A particular advantage of the embodiment in accordance with Fig. 2 lies in that it is possible to considerably reduce the number of formers 02, 03 in connection with several "books" of a product, which have been stapled separately of each other, or in part not stapled. For example, in connection with a similar variability of the product it is possible to save an additional former (balloon former) otherwise arranged upstream of the former 02. Considerable construction costs and structural size can be saved by this.

In a third exemplary embodiment (Fig. 3), the two continuous webs 27, 28 are conducted from the former 02 on both sides of a former 03 which, for example, is located underneath it, via deflection rollers 09, 09'. The same as in the first mentioned examples, a stapler 17 (represented by dashed lines) can be arranged on one of the two, or both, of the continuous web guides of the continuous webs 27, 28. Upstream of the folding apparatus 19, the two continuous webs 27, 28 are brought together with the continuous web 24 from

the lower former 03, wherein the latter comes to lie between the two first mentioned. In an advantageous embodiment, a stapler 17' can be arranged in the continuous web guide of the continuous web 24 in addition to or in place of the stapler or staplers 17. In an embodiment distinguished by great flexibility, the continuous web guide of the continuous web 24, as well as at least one of the continuous web guides of the continuous webs 27, 28 moving around both sides of the former 03, have a stapler 17, 17'. If it is intended to provide an even more variable production, the continuous web guides of the three continuous webs 24, 27, 28 each have a stapler 17, 17'.

Additional bypass continuous guides 33, 34, indicated by way of example in Fig. 3, can be provided in all three exemplary embodiments, by means of which a portion of the - for example again divided - continuous web 24, 27, 28, or the entire continuous web 24, 27, 28 can be guided around a stapler 17, 17' located on a continuous guide, without being stapled. In connection with this, only two bypass continuous web guides 33, 34 without represented deflection rollers, etc., are shown in dashed lines in Fig. 3. However, these can be optionally transferred in a further development to individual or several continuous webs 24, 27, 28 from the three exemplary embodiments.

In a fourth exemplary embodiment (Fig. 4), respectively one stapler 17, 17' is assigned to two formers 02, 03, each with a longitudinal cutter 07, 08, in the guide path from the respective former 02, 03 to the outlet of the continuous web mixing device 01. The continuous web mixing device 01 here has deflection rollers 09, 14, 36, 37, via which one partial

continuous web 28, or the entire continuous web 26 of the one former 02 can be passed, together with a partial continuous web 27', or the entire continuous web 24 of this second former 03, 02, through the stapler 17' assigned to the second former 03, or in an advantageous embodiment is passed through it. Therefore it is not required to determine the correct approach to a former already in a superstructure, not represented, by means of turning partial webs, instead, after passing through the formers 02, 03, partial webs can still be assigned to the other partial continuous web 27', or the continuous web 24. It is also possible to process all partial webs, i.e. the two folded and cut continuous webs 24, 26, into a product via one of the staplers 17', 17. In the same way is it possible that a partial continuous web 28, together with a continuous web 24 or a partial continuous web 27' of the other former 03 is stapled, while the remaining partial continuous web 27 of the first former 02 passes through the assigned stapler 17 without being stapled (i.e. the stapler is not switched on or is out of service). The arrangement with the mentioned reference numerals is to be applied symmetrically to the opposite guide.

By means of the mentioned guide paths over both staplers 17, 17', a main continuous web 29 at the outlet can be achieved in a first mode of operation, which has a portion of one or several layers not stapled (for example switched-off staplers 17, 17'), and a portion with several layers stapled together (represented in Fig. 5a) from the inside to the outside). In a second mode of operation (Fig. 5b)), the main continuous web is constituted by two portions, each of which has several layers stapled together, wherein the number

of layers between the two portions can be variable by means of the above mentioned bypass.

In an advantageous manner, the continuous web mixing device 01 has further deflection rollers 11, 16, over which partial continuous webs 28, 28' of the one and/or the other former 02, 03 is or are conducted without passing through one of the staplers 17, 17' along an appropriate guide path between the two staplers 17, 17'.

By means of this the above mentioned modes of operation and the products resulting therefrom at the main continuous web 29 can be expanded in such a way that, in a third mode of operation, an additional portion with one or several layers which are not stapled is introduced, in addition to the mentioned sequences between the already mentioned portions - in particular the two stapled portions of the second mode of operation - (Fig. 5c)). The number and origin of the layer(s) of this last mentioned portion is variable, it/they can from one, the other, or both formers 02, 03.

Even more flexible in regard to the product to be produced, the continuous web mixing device 01 is embodied with further deflection rollers 09, 09', 10, 10', 11, 12, over which a partial continuous web 27, 28, 27', 28' from at least one of the formers 02, 03 can be conducted on an outside of the continuous web mixing device 01 around the two staplers 17, 17' to the outlet without passing through one of the staplers 17, 17'. In Fig. 4 such an adjoining guide path, identified as bypass continuous web guide 33, 34, is provided for each of the two formers 02, 03. This makes it possible in addition to the two first mentioned modes of operation and also to the third mode of operation, to add to

the already mentioned sequence of portions a further portion with one or several layers, which have not been stapled, on the one and/or the other exterior continuous web side of the main continuous web 29 now obtained, or to actually add it. Thus, for example in a fourth mode of operation a sequence of one unstapled portion, a stapled portion, an unstapled portion and a further stapled portion (Fig. 5d)), and in a fifth mode of operation an additional unstapled portion (Fig. 5e)), is possible or is provided. In a sixth mode of operation a sequence of an unstapled portion, a stapled portion and a second stapled portion (Fig. 5f)), and in a seventh mode of operation an additional further unstapled portion (Fig. 5g)), can be achieved or is produced.

The mentioned deflection rollers 09, 11, 12, 13, 14, 16, 36, 37 are embodied as rollers 09, 11, 12, 13, 14, 16, in particular as friction-driven 09, 11, 12, 13, 14, 16.

The main continuous web 19 is transversely cut in the folding apparatus 19, and the product sections obtained are transversely folded, for example.

The transversely folded products which can be obtained with the above mentioned modes of operation are represented by way of example in Figs. 5a) to g). In this case the number of layers per portion (stapled or not stapled) has been selected only as example. But the number of layers in the portion can also be higher or lower than represented. Different portions can have different numbers of layers. In particular in connection with portions not stapled, the number of layers can also be 1. Stapling is indicated by a line connecting the layers in the area of the folded spine.

Inter alia, the products which can be obtained by the different modes of operation of the device in accordance with Fig. 1 are also represented in Fig. 5. Fig. 5a) shows a product where bypassing of a partial continuous web 28 not intended to be stapled takes place.

Inter alia, the by different modes of operation of the device in accordance with Fig. 2 can also be taken from Fig. 5 (but not exhaustively). For example, the product in accordance with Fig. a) (one stapler switched off) and Fig. 5b) with only the partial continuous webs 27, 28 shown in solid lines, can be produced. Fig. 5c) can be produced without taking a guidance of the partial continuous web 31 into consideration - such as is provided in a basic version of the embodiment in accordance with Fig. 2 - but with a possibility of the partial continuous web 32. With a left stapler 17 provided, the center stapler 17 switched off or non-existent, as well as the turned-on right stapler 17, Fig. 5c) can also be achieved with the partial continuous web 31 (without guidance of the partial continuous web 32), and with the center stapler 17 additionally turned on, Fig. 5j) can be achieved. If, however, the left stapler 17 is not provided or switched off instead, Fig. 5m) can be realized. Fig. 5h) shows a possible product created by means of all drawn in guides and the three (turned on) staplers 17.

In addition to the products (Figs. 5a) to 5g)) mentioned in the portion of the specification in connection with Fig. 4, but to be transferred to operating situations with selectively switch-off or not provided staplers 17, 17', or used or unused bypasses 33, 34, a product in accordance

with Fig. 5i) is possible with the device in accordance with Fig. 3, taking the bypass 33 and three staplers 17, 17' into consideration, and without the bypass 33, but with the bypass 34, the reverse of the product from Fig. 5h). If all three continuous webs or partial continuous webs 24, 27, 28, drawn in solid lines, have a stapler 17, 17', the product in accordance with Fig. 5j) can be produced from three portions without a further bypass 33, 34. If a stapler 17' is only provided for the continuous web 24 (or selectively only this one of two or three staplers 17, 17' is switched on), a product in accordance with Fig. 5k) results.

However, the sequence in the representation from the inside to the outside can be reversed, either by an appropriate guidance through the continuous web mixing device 01, or by changing the folding apparatus 19.

It is of particular advantage that as a rule the mentioned products can be made at least to a large extent without turning, in particular without previous turning of partial webs in a superstructure upstream of the formers 02, 03. The partial webs to be assigned to one or the other continuous web, or partial continuous web 24, 27, 28, are transferred to the desired location in the continuous web mixing device 01.

List of Reference Symbols

- 01 Continuous web mixing device
- 02 Former
- 03 Former
- 04 Guide roller
- 05 Traction roller, traction roller group
- 06 Guide roller
- 07 Longitudinal cutter
- 08 Longitudinal cutter
- 09 Deflection roller, roller
- 10 Traction roller, traction roller group
- 11 Deflection roller, roller
- 12 Deflection roller, roller
- 13 Deflection roller, roller
- 14 Deflection roller, roller
- 15 -
- 16 Deflection roller, roller
- 17 Stapler
- 18 Guide roller
- 19 Folding apparatus
- 20 -
- 21 Cylinder, cutting cylinder
- 22 Cylinder, cutting groove, point and folding blade cylinder
- 23 Cylinder, folding jaw cylinder
- 24 Continuous web, paper web
- 25 -
- 26 Continuous web, paper web

27 Partial continuous web, paper web
28 Partial continuous web, paper web
29 Main continuous web
30 -
31 Partial continuous web, paper web
32 Partial continuous web, paper web
33 Bypass continuous web guide
34 Bypass continuous web guide
35 -
36 Deflection roller, roller
37 Deflection roller, roller

09' Deflection roller, roller
10' Deflection roller, roller
17' Stapler
27' Partial continuous web, paper web
28' Partial continuous web, paper web